Corrosion of reinforcing steel in fly ash blended cement concrete

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Abstract: Using a technique for accelerated corrosion monitoring, corrosion-resisting characteristics of reinforcement of four plain and 36 fly ash blended cement concretes have been evaluated. Three fly ashes of bituminous, sub-bituminous and lignite origins have been used, in conjunction with four plain cements having C3A contents of 2%, 9%, 11%, and 14%. The 36 blended cements were formulated such that each of the four C3A cements had 10%, 20%, and 30% cement replacements by each of the three fly ashes. Results of corrosion monitoring tests show that fly ash blending of plain cements by 30% partial replacement improved the corrosion-resistance performance twofold to threefold over plain type I and type V cement concretes, respectively, in terms of corrosion-initiation time. Fly ash of lignite origin exhibited better impermeability and corrosion-resisting characteristics than bituminous and sub-bituminous fly ashes. Level of replacement is a significant performance parameter, with the best performance observed for 30% replacement. The time to initiation of corrosion and weight loss were significantly influenced by the C3A content of the cement; 9%, 11%, and 14% C3A cements performed 1.75, 1.93, and 2.45 times better than the 2% C3A cement in terms of corrosion-initiation time. The beneficial C3A effect was also operative in fly ash blended cement concretes, although on a reduced level.